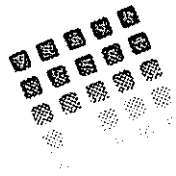

MATERIALS
ANALYTICAL
SERVICES

Expert Report

July 31, 1996

Prepared in Connection with

The Prudential Insurance Company of America et. al.

vs.

United States Gypsum Company et. al.
Civil Action Nos. 87-4227 and 87-4238 (HAA)

Prepared by:
Dr. William E. Longo
Materials Analytical Services
Norcross, GA

Raleigh Office:
616 Hutton Street • Suite 101
Raleigh, North Carolina 27606
(919) 829-7041 • FAX (919) 829-5518

Atlanta Office:
3597 Parkway Lane • Suite 250
Norcross, Georgia 30092
(770) 448-3200 • FAX (770) 368-8256

Table of Contents

Table of Contents - Continued

1.0 William E. Longo, Ph.D. Qualifications

My name is Dr. William E. Longo, I am an electron microscopist who specializes in materials science and engineering. I have a Master of Science degree in Engineering and a Doctorate of Philosophy degree in Material Science and Engineering, both from the University of Florida. I am currently the president of Materials Analytical Services, Inc., a company specializing in materials characterization and asbestos analysis.

I have served on the Peer Group Review Committee for the Environmental Protection Agency (EPA) which was responsible in guiding EPA's research involving various asbestos issues in occupied buildings. Additionally, I was invited by the EPA, along with others, to help develop their protocol for taking and analyzing settled asbestos dust samples. I am also a member of the American Society of Testing Materials (ASTM Subcommittee for asbestos sampling and analysis). My primary contribution in this particular subcommittee involved such things as being the primary author of ASTM method D-5755-95 entitled "Micro-vacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Concentration".

I have authored and co-authored many articles regarding asbestos sampling and testing techniques and I am a member of numerous professional societies. A copy of my current curriculum vitae is included with this statement and is incorporated herein.

I am an expert in the field of materials characterization, the use of materials for specific applications, and the ability to determine their physical and chemical properties using recognized testing procedures. I am also an expert on asbestos sampling and analysis and related microscopy techniques. I will testify about testing protocols routinely used for materials characterization and analyzing asbestos samples, including sample preparation and fiber counting. I will testify about indirect sample preparation

which is the standard protocol in the industry for analyzing dust samples for asbestos. I will also testify as a Materials Scientist regarding the typical ingredients used in both asbestos and non-asbestos building products in relationship to their use and function.

I will testify about the differences between the types of microscopes typically used to analyze asbestos samples. Electron microscopes are superior for analyzing asbestos air or dust samples because of the microscopic nature of asbestos structures. I will demonstrate the small microscopic size of typical respirable asbestos fibers, and also show that other microscopes (such as the phase contrast microscope) will often not detect asbestos fibers that are present on an air sample filter or on a sample grid. This would include long fibers (greater than or equal to 5.0 micrometers) that are very thin (less than approximately 0.25 micrometers wide). I will testify that it is my opinion that W.R. Grace had the capability to analyze asbestos by electron microscopy in the early 1960's and suggested that asbestos be tested by electron microscopy in 1970.

I have personally and with the aid of my staff, analyzed thousands of asbestos samples of all types including bulk samples, micro-vacuum and static dust samples, air, water and human tissue samples. I will explain the methodology employed in analyzing each type of sample. I will discuss the Yamate method and my company's employment of the developer of this method, George Yamate.

I will testify that my company developed for the EPA, a protocol for asbestos sampling and analysis at Superfund sites and has provided consultation in microscopy to other governmental agencies. I will also testify about the assistance that MAS has given to NATO in determining if there was asbestos in their schools and other buildings. I will testify that I have been asked to analyze samples for asbestos by companies that formerly made asbestos products.

2.0 Microvacuum Dust Analysis

I will testify that the use of ambient air sampling is an inadequate technique to determine if in-place asbestos containing materials (ACM) such as fireproofing is releasing asbestos and causing surface/building contamination. As recognized by the EPA, air sampling is only a "snap shot" in time and will likely miss a release episode of asbestos particles from the in-place fireproofing. I will further explain that the best analytical protocol for the determination of asbestos surface contamination in a building is the indirect microvacuum method for number count concentrations. The microvacuum method has the advantage over ambient air sampling since it can measure the amount of asbestos that has accumulated over time on a surface and in some instances, provide information about the source.

I will testify that I have been involved in analyzing settled dust samples for both private clients and government agencies. I will explain that the indirect method of analysis for dust samples is the standard procedure recognized by ASTM. I will demonstrate (using overlays) why this method is preferred for analyzing heavily loaded samples (such as routine dust samples), without affecting the integrity of the results. I will testify that other experts in the field use the same method, that governmental agencies recognize this method as a proper procedure and additionally, I will state that certain surface concentrations of asbestos structures have been deemed contaminated in the opinion of recognized experts and governmental agencies. A typical surface contamination chart is shown as follows:

	Asbestos Structures Per Square Centimeter	Asbestos Structures Per Square Foot	Asbestos Surface Contamination
1)	0 - 1000	0 to 1 Million	None
2)	1000 to 10,000	1 Million to 10 Million	Low
3)	10,000 to 100,000	10 Million to 100 Million	Medium
4)	100,000 to 1 Million	100 Million to 1 Billion	High
5)	Greater than 1 Million	Greater than 1 Billion	Severe

I will testify that the results for the number count microvacuum method is expressed in number of "structures" per unit area of measured surface. I will explain that structures as seen by the TEM include fibers, bundles, clusters and matrices, with the last three being different types of groupings of fibers. Accordingly, I will state that the reporting of asbestos "structures" under-represents the actual number of asbestos fibers in the sample.

In addition, I will testify that the nozzle face collection method (ASTM protocol) does not vacuum all the dust on the surface that is sampled and that after a surface dust sample has been collected, there are still may be asbestos structures on the surface that are not counted as well. I will testify that based on my experience and training, the indirect mass method for analyzing asbestos in dust has been shown to be inaccurate and non-reproducible.

I will testify that GSA uses a surface dust cleanliness standard for asbestos. I will also testify that dust samples from buildings which do not have asbestos-containing fireproofing products, did not show asbestos contamination as compared to dust samples from Prudential buildings that will be discussed in this report.

I will testify based on my experience, training and analytical work, that the results obtained from the indirect number count microvacuum method is an accurate

and precise representation of the actual asbestos concentration present on the surface. I will further testify that the indirect sample preparation process does not alter or change the form of the dust particulates that are sampled. That is, the asbestos structures observed in the electron microscope from the dust sample are representative of the type and number of asbestos structures actually released from the fireproofing.

I will testify about the analysis of dust samples taken at Prudential buildings by both Compass Environmental and Law Companies. I will describe how the samples were analyzed and the meaning of the results. I will present a slide presentation at trial that will demonstrate to the jury how the indirect microvacuum dust analysis is performed.

3.0 Surface Dust Samples Collected by Law Companies & Compass Environmental

The following Prudential buildings and their corresponding dust results and interpretation will be presented in my testimony.

3.1. 130 John Street - New York, New York

MAS project M1839 report on eleven surface dust samples collected on November 9, 1988, covering locations on the 2nd, 5th, 6th, 9th, 15th, 19th, 21st, 23rd and 25th floors and had concentrations ranging from below the detection limit (BDL) to 28.4 thousand asbestos structures per square centimeter (BDL to 26.3 million asbestos structures per square foot). The MAS project M13586 report on four surface dust samples collected on July 21, 1995, covering locations on the 7th, 12th, 14th and 25th floors had concentrations ranging from 1.1 million to 26.2 million asbestos structures per square centimeter (1.0 billion to 24.3 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the 130 John Street building and was primarily caused by the fireproofing in the building which was Cafco

Blaze Shield Type D as manufactured by U.S. Mineral. The fifteen surface samples from the 130 John Street building were collected by Law Companies.

3.2. Hunt Valley Marriott Hotel - Hunt Valley, Maryland

MAS project M2074 report on six surface dust samples and one HVAC pre-filter collected on December 7, 1988, covering locations in the employee cafeteria, men's locker room, room 2132, 2nd floor north wing, as well as the AHU pre-filter north wing had concentrations ranging from BDL to 2.3 million asbestos structures per square centimeter (BDL to 2.1 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the Hunt Valley Marriott Hotel and was caused primarily by the mineral wool base fireproofing in the building described in my July 13 and July 17, 1990 product identification report. The six surface dust samples were collected by Law Companies.

3.3. Renaissance Tower - Dallas, Texas

MAS project M2246 report on nine surface dust samples collected on January 17, 1989, covering locations in the basement, 18th, 26th, 36th, 40th, 44th & 49th floors of the Renaissance Building had concentrations ranging from BDL to 11.7 Million asbestos structures per square centimeter (BDL to 10.9 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the Renaissance building and was caused primarily by the fireproofing in the building which was Monokote-3 as manufactured by W.R. Grace. The nine surface dust samples were collected by Law Companies.

3.4. Prudential Plaza - Newark, New Jersey

MAS project M1526 report on seven surface dust samples collected on August 1, 1988, covering locations on the fifth and sixth floors of the Prudential Plaza had

concentrations ranging from BDL to 470.8 asbestos structures per square centimeter (BDL to 436.7 thousand structures per square foot). MAS project M13584 reported on the seven dust samples collected on July 19, 1995, covering locations in the mall and on the 5th floor of the Prudential Plaza building had concentrations of 1.2 million to 28.7 million asbestos structures per square centimeter (1.1 billion to 26.6 billion asbestos structures per square foot). I will testify that the surface dust analysis from the MAS M13584 report indicates contamination in the Prudential Plaza building was primarily caused by the fireproofing in the building which was Firecode, as manufactured by U.S. Gypsum in the Mall area and a mineral based fireproofing on the 5th floor, as described in my July 13, 1990 product identification report. The fourteen dust samples were collected by Law Companies.

3.5. 5 Penn Center - Philadelphia, Pennsylvania

MAS project M1527 report on five surface dust samples collected on August 23, 1988, covering locations on the floor of the freight elevator and the 4th, 8th, 26th and 29th floor of the 5 Penn Center building had concentrations of 160.9 to 91.6 thousand structures per square centimeter (149.2 thousand to 85.0 million per square foot). MAS project M13585 report on five surface dust samples collected on July 20, 1995, covering locations on 35th floor of the 5 Penn Center building had concentrations of 3.0 million to 9.8 million asbestos structures per square centimeter (2.7 billion to 9.1 billion structures per square foot). I will testify that the surface dust analysis indicates contamination in the 5 Penn Center building and was primarily caused by the fireproofing in that building which was SprayDon, as manufactured by U.S. Gypsum. The ten surface dust samples for the two projects were collected by Law Companies.

3.6. Embarcadero Center One - San Francisco, California

MAS project M1869 report on the fifteen surface dust samples collected on November 16, 1988, covering locations on the Mezzanine, 4th, 18th, 21st, 22nd, 23rd,

24th, 27th, 28th, 30th, 33rd, 38th, 42nd and 43rd floors of the Embarcadero Center One had concentrations ranging from BDL to 8.5 million asbestos structures per square centimeter (BDL to 7.9 billion asbestos structures per square foot). MAS project M13471 report on four surface dust samples collected on June 29, 1995, covering locations on the Mezzanine, 6th and 35th floors of the Embarcadero Center One had concentrations ranging from 8.3 Million to 12.2 Million asbestos structures per square centimeter (7.7 billion to 11.3 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the Embarcadero Center One and was primarily caused by the fireproofing in the building which was Monokote-3 as manufactured by W.R. Grace. The nineteen surface dust samples were collected by Law Companies.

3.7. Embarcadero Center Two - San Francisco, California

MAS project M1304 report on the nine surface dust samples collected in 1988, covering locations on the podium level, 5th, 6th, 7th, 8th, 9th, 10th,11th floor and from Radio Shack of the Embarcadero Center Two building had concentrations ranging from BDL to 95.8 thousand asbestos structures per centimeter square (BDL to 89.0 Million asbestos structures per square foot). MAS projects M13250 and M13470 reported on six surface dust samples collected on March 30, 1994 and June 29, 1995, respectively, covering locations on the 3rd, 7th, 8th, 10th and 11th floors of the Embarcadero Center Two had concentrations ranging from 2.0 million to 27.4 million asbestos structures per centimeter square (1.8 billion to 25.4 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates that contamination in the Embarcadero Center Two building and was primarily caused by the asbestos containing fireproofing in the building which was Monokote-3 as manufactured by W.R. Grace. The fifteen dust samples were collected by Law Companies.

3.8. Century Center 2200 and 2600 Building - Atlanta, Georgia

2200 Building

MAS project M2140 report on ten surface dust samples collected December 19, 1988, covering locations in the file storage room and on the 1st, 2nd, 3rd, 4th, 5th and 6th floors of the 2200 building had concentrations ranging from 1.2 thousand to 12.6 million asbestos structures per square centimeter (1.1 million to 11.7 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in 2200 Century Center building and was primarily caused by the fireproofing in the building that was Monokote-3 as manufactured by W.R. Grace. The ten surface dust samples were collected by Law Companies.

2600 Building

MAS project M2140 report on eight surface dust samples collected December 19, 1988 covering locations in the service elevator, basement and on the 1st, 3rd and 4th floors on the 2600 building had concentrations ranging from 326 to 20.6 million asbestos structures per square centimeter (302.6 thousand to 19.1 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the 2600 Century Center building and was primarily caused by the fireproofing in the building that was Monokote-3, as manufactured by W.R. Grace. The eight samples were collected by Law Companies.

3.9. First Florida Tower - Tampa, Florida

MAS project M1811 report on eleven surface dust samples collected November 7, 1988, covering locations on the 11th, 14th, 18th, and 35th floors of the First Florida Tower had concentrations ranging from BDL to 784.6 thousand asbestos structures per centimeter square (BDL to 729.1 million asbestos structures per square foot). MAS project M13824 report on four surface dust samples collected on September 11, 1995, covering locations in the basement, 1st, 9th and 35th floors had concentrations ranging from 1.2 million to 39.7 million asbestos structures per centimeter square (1.1 billion to

36.8 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the First Florida Tower and was primarily caused by the fireproofing in the building which is Monokote-3, as manufactured by W.R. Grace. The fifteen dust samples were collected by Law Companies.

3.10. 1100 Milam - Houston, Texas

MAS project M2252 report on fifteen surface dust samples collected on December 6, 1988, covering locations on the 4th, 6th, 8th, 10th, 12th, 14th, 16th, 18th, 20th, 24th, 32nd, 34th and 36th floors had concentrations ranging from 1.8 thousand to 6.2 million asbestos structures per square centimeter (1.7 million to 5.7 billion per square foot). I will testify that the surface dust analysis indicates contamination in the 1100 Milam building and was primarily caused by the fireproofing in the building which is Monokote-3, as manufactured by W.R. Grace. The fifteen dust samples were collected by Law Companies.

3.11. Northland Office Complex - Southfield, Michigan

MAS project M1524 report on six surface dust samples collected in 1988, from the East and West Tower covering locations at the west entrance and the 1st, 7th, 8th and 9th floors of the Northland office complex and showed concentrations ranging from 83.8 to 30.2 thousand asbestos structures per centimeter square (77.8 thousand to 40.1 million asbestos structures per square foot). MAS project M15197 report on three surface dust samples collected on May 10, 1996 from the West Tower, covering locations on the 4th, 6th, and 8th floors had concentrations ranging from 2.2 million to 6.3 million asbestos structures per square centimeter (2.0 billion to 5.9 billion structures per square foot). MAS project M15196 report on three surface dust samples collected on May 10, 1996 from the East Tower covering locations on the 2nd, 7th and 9th floors had concentrations ranging from 201.4 thousand to 3.3 million asbestos structures per square centimeter (186.5 million to 3.1 billion per square foot). I will testify that the

surface dust analysis indicates contamination in the Northland office complex (East and West Tower) and was primarily caused by the fireproofing in the building which is Firecode, as manufactured by U.S. Gypsum. Law Companies collected the six surface dust samples for project M1524 and Compass Environmental collected the six dust samples for projects M15197 and M15196.

3.12. Northwest Financial Center - Bloomington, Minnesota

MAS project M1892 report on fifteen surface dust samples collected November 2, 1988, covering locations in the stairwell and on the 1st, 2nd, and the 3rd floors of the Northwest Financial Center had concentrations ranging from BDL to 2.8 million asbestos structures per centimeter square (BDL to 2.6 billion structures per square foot). I will testify that the surface dust analysis indicates contamination in the Northwest Financial Center building and was caused primarily by the fireproofing in the building which was Monokote-3, as manufactured by W.R. Grace. The fifteen dust samples were collected by Law Companies.

3.13. Southdale Office Complex - Edina, Minnesota

MAS project M3038 report on seven surface dust samples collected February 2, 1989, covering locations on the 1st, 2nd, 3rd, 4th, 5th and 6th floors of the Southdale Office Complex had concentrations ranging from BDL to 15.0 million asbestos structures per square centimeter (BDL to 13.9 billion structures per square foot). I will testify that the surface dust analysis indicates contamination in the Southdale Office Complex and was primarily caused by the fireproofing in the building which was Monokote-3, as manufactured by W.R. Grace. The seven dust samples were collected by Law Companies.

3.14. Twin Towers - Atlanta, Georgia

MAS project M13887 report on the four surface dust samples collected on September 25, 1995, covering locations on the 21st floor of the Twin Tower building had concentrations ranging from 10.0 million to 30.3 million asbestos structures per square centimeter (9.5 billion to 28.3 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the Twin Tower building was primarily caused by the fireproofing in the building which was SprayDon, as manufactured by U.S. Gypsum. The four dust samples were collected by Law Companies.

3.15. Prudential Plaza - Denver, Colorado

MAS project M1161 report on ten surface dust samples collected on February 24, 1988, covering locations from both buildings A and B on the street level, 1st, 2nd and 3rd floors of the Prudential Plaza building had concentrations ranging from BDL to 1.2 million asbestos structures per centimeter square (BDL to 1.1 billion asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the Prudential Plaza-Denver and was primarily caused by the fireproofing in the building which was Monokote-3, as manufactured by W.R. Grace. The ten surface dust samples were collected by Law Companies.

3.16. One Chatham Center, Pittsburgh Hyatt - Pittsburgh, Pennsylvania

MAS project M1303 report on the nine surface dust samples collected on April 28, 1988 covering locations on the basement, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th and 9th floors of the One Chatham/Hyatt building had concentrations ranging from 72.8 to 80.4 thousand asbestos structures per square centimeter (67.4 thousand to 74.6 million asbestos structures per square foot). I will testify that the surface dust analysis indicates contamination in the One Chatham Center/Hyatt Building was primarily

caused by the fireproofing in the building which was Firecode, as manufactured by U.S. Gypsum. The nine dust samples were collected by Law Companies.

4.0 Surface Dust Samples Collected by Compass Environmental (Side by Side Comparison)

I will testify that the fundamental scientific process for analyzing surface microvacuum dust samples has not significantly changed since the mid 1980's. The overall process can be described as the suspension and mixing of dust particles in a water solution followed by filtering a known volume water/dust suspension through an appropriate filter media. The filter is then prepared and analyzed using the standard transmission electron microscopy (TEM) protocols. I will further testify that the analysis portion of the current ASTM indirect number count protocol is essentially the same protocol that has been used for all the dust samples that have been collected in the Prudential buildings and analyzed at my laboratory.

However, I will testify that in the collection process, there was a fundamental change of the collection procedure on about August of 1989 that would have an effect on the analytical results. Until August of 1989, surface dust was collected by the consultants from Law Companies with an open faced 37mm air cassette. In August of 1989, the open face cassette collection process was changed to the nozzle close face cassette collection process which is the collection process that is currently described in the ASTM Standard protocol. I will testify that the open face 37mm cassette has a much lower efficiency of collection. This lower collection efficiency is due to a lower face velocity at the point of dust collection compared to the face velocity for the nozzle close face procedures. The lower collection efficiency will cause a reduction in the asbestos concentration collected from what is actually on the surface.

This lower collection efficiency was demonstrated in a side by side surface dust sample study that compared the open face collection procedure to the nozzle closed face procedure and was performed by Mr. William Ewing in five of the Prudential

buildings in 1995. The analytical data for this study are shown in sections 4.1 through 4.5 and is MAS project M13908. The side by side study showed that on average, the amount of asbestos dust removed from the surface by the nozzle close face method was about one order of magnitude higher than the samples collected by the open face cassette method. Therefore, I will testify that surface dust samples collected in the Prudential building by the open face cassette technique collected on average, only about 10% of the actual amount of asbestos that was on the surface sampled. My opinion about the open faced cassette collection efficiency is based on the following data for the side by side surface dust samples and face velocity calculations. Additionally, I will state that in almost all of the Prudential buildings where the open face cassette method was used to collect surface dust, the samples did show asbestos surface contamination even though the concentrations measured were conservative to the actual amount present.

4.I. Renaissance Tower - Dallas, Texas

a. Nozzle face cassette (AB)

The three samples collected August 31, 1995, covering locations on the 26th, 39th and 46th floor had concentrations ranging from 2.4 million to 18.3 million asbestos structures per square centimeter (2.2 billion to 17.0 billion asbestos structures per square foot).

b. Open face cassette (PR)

The three surface dust samples collected on August 31, 1995, covering locations on the 26th 39th and 46th floor had concentrations ranging from 409.9 thousand to 3.3 million asbestos structures per square centimeter (380.8 million to 3.1 billion structures per square foot).

I will testify that these surface dust analyses from both types of sample collection procedures indicates contamination in the Renaissance Tower and was primarily

caused by the fireproofing. Additionally, I will state, that the open face cassette had a lower collection efficiency than the nozzle face cassette.

4.2. Prudential Plaza - Newark, New Jersey

a. Nozzle face cassette (AB)

The three surface dust samples collected on September 26, 1995 covering locations in the Mall and on the 5th floor had concentrations ranging from 2.4 million to 23.5 million asbestos structures per square centimeter (2.2 billion to 21.7 billion per square foot).

b. Open face cassette (PR)

The three surface dust samples collected on September 26, 1995 covering locations in the mall and on the 5th floor had concentrations ranging from 97.5 thousand to 1.2 million asbestos structures per square centimeter (90.6 million to 1.2 billion per square foot).

I will testify that these surface dust analyses from both types of sample collection processes indicates contamination in the Prudential Plaza and was primarily caused by the fireproofing. Additionally, I will state, that the open cassette had a lower collection efficiency than the nozzle face cassette.

4.3 Embarcadero Center One - San Francisco, California

a. Nozzle face cassette (AB)

The three surface dust samples collected on August 29, 1995 covering locations on the mezzanine, 9th and 26th floors had concentrations ranging from 540.8 thousand to 1.3 million asbestos structures per centimeter square (500.7 million to 1.2 billion asbestos structures per square foot).

b. Open face cassette (PR)

The three surface dust samples collected on August 29, 1995 covering locations on the mezzanine, 9th and 26th floors had concentrations ranging from 141.6 thousand to 382.0 thousand asbestos structures per square centimeter (131.7 million to 355.2 million asbestos structures per square foot).

I will testify that these surface dust analysis from both types of sample collection processes indicate contamination in the Embarcadero Center One building and was primarily caused by the fireproofing. Additionally, I will state, that the open face cassette had a lower collection efficiency than the nozzle face cassette.

4.4 Embarcadero Center Two - San Francisco, California

a. Nozzle face cassette (AB)

The three surface dust samples collected on August 30, 1995 covering locations on the 3rd, 6th and 7th floors had concentrations ranging from 612.1 thousand to 13.9 million asbestos structures per square centimeter (566.7 million to 12.8 billion asbestos structures per square foot).

b. Open face cassette (PR)

The three surface dust samples collected on August 30, 1995 covering locations on the 3rd, 6th and 7th floor had concentrations ranging from 402.8 thousand to 1.1 million asbestos structures per square centimeter (374.2 million to 1.0 billion asbestos structures per square foot).

I will testify that these surface dust analyses from both types of sample collection processes indicate contamination in the Embarcadero Center Two building and was primarily caused by the fireproofing. Additionally, I will state, that the open face cassette had a lower collection efficiency than the nozzle face cassette.

4.5. 5 Penn Center - Philadelphia, Pennsylvania

a. Nozzle face cassette (AB)

The three surface dust samples collected on September 10, 1995 covering locations on the 35th floor had concentrations ranging from 4.4 million to 14.2 million asbestos structures per centimeter square (4.1 billion to 13.1 billion structures per square foot).

b. Open face cassette (PR)

The three surface dust samples collected on September 10, 1995 covering locations on the 35th floor had concentrations ranging from 231.6 thousand to 820.0 thousand asbestos structures per square centimeter (215.2 million to 761.8 million asbestos structures per square foot).

I will testify that these surface dust analyses from both types of sample collection processes indicate contamination in the 5 Penn Center building and was primarily caused by the fireproofing. Additionally, I will state, that the open face cassette had a lower collection efficiency than the nozzle face cassette.

A summary of the results for the comparison of the nozzle face (AB) v. Open face (PR) is as follows:

		Average Concentration (Arithmetic Mean) Per Square Foot	
	Building	(Nozzle)	(Open Face)
1)	Renaissance	7.7 Billion	1.8 Billion
2)	Prudential Plaza	8.8 Billion	467 Million
3)	Embarcadero 1	770 Million	229 Million
4)	Embarcadero 2	5.5 Billion	625 Million
5)	5 Penn Center	8.5 Billion	525 Million

5.0. Friability and Ceiling Tile Lifting Demonstrations

Based on my background, experience and knowledge, I will testify that the asbestos containing fireproofing materials in the Prudential buildings discussed in this report are friable as defined by the Environmental Protection Agency. Additionally, I will testify, that those fireproofing materials are non-cementitious and therefore, do not have any cement/concrete properties with respect to hardness, durability or chemical composition as defined by Materials Scientists. Furthermore, I will testify that when in-place fireproofing in the Prudential buildings is disturbed in the present day with forces similar to those used in friability demonstrations by Mr. Richard Hatfield, these forces will cause the release of a substantial amount of unbound asbestos structures. These asbestos structures will first become airborne then settle on a surface in concentrations high enough that will cause contamination.

I will also testify that asbestos contaminated dust can become reentrained. An example of this reentrainment occurs during the routine lifting of ceiling tiles which have asbestos contaminated dust on top of them. This reentrainment of contaminated asbestos dust will become airborne into the air/breathing zone of the individual lifting the tiles. I am basing my opinion on my experience and training as well as on the observations and analytical data from the Friability and Ceiling Tile lifting demonstrations that were performed in the Prudential Plaza, 5 Penn Center and the Embarcadero One building by Mr. Hatfield.

The following are the surface dust results for the three Prudential buildings that were used for the above described demonstrations as shown in sections 5.1, 5.2 and 5.3.

5.1. Prudential Plaza - Newark, New Jersey

MAS project M13678 report on two dust samples taken on August 5, 1995. The first surface dust sample showed that the concentration existing on top of the ceiling tile before the lifting demonstration was 20.4 million asbestos structures per square centimeter (18.9 billion structures per square foot). The second surface dust sample was taken off a new clean surface that had been placed under the work area before the friability demonstration. This surface dust sample showed that the friability demonstration caused the clean surface to be contaminated with a concentration of 12.4 million asbestos structures per square centimeter (11.5 billion per square foot). I will testify that the results of these analysis shows that the fireproofing in the Prudential Plaza building was the primary cause of the surface contamination, that the fireproofing is friable and that contaminated asbestos dust in this building can become reentrained from normal maintenance activities.

5.2 5 Penn Center - Philadelphia, Pennsylvania

MAS project M13677 report on two dust sample taken on August 4, 1995. The first surface dust sample showed that the concentration existing on top of the ceiling tile before the lifting demonstration was 7.2 million asbestos structures per square centimeter (6.7 billion per square foot). The second surface dust sample was taken off a new clean surface that had been placed under the work area before the friability demonstration. This surface dust sample showed that the friability demonstration caused the clean surface to be contaminated with a concentration of 9.5 million asbestos structures per square centimeter (8.8 billion per square foot). I will testify that the results of these analysis shows that the fireproofing in the 5 Penn Center building was the primary cause of the surface contamination, that the fireproofing is friable, and

that contaminated asbestos dust in this building can be reentrained from normal maintenance activity.

5.3 Embarcadero Center One - San Francisco, California

MAS project M13748 report on two dust sample taken on August 19, 1995. The first surface dust sample showed that the concentration existing on top of the ceiling tile before the lifting demonstration was 40.6 million asbestos structures per square centimeter (37.8 billion asbestos structures per square foot). The second surface dust sample was taken off a new clean surface that had been placed under the work area before the friability demonstration. This surface dust sample showed that the friability demonstration caused the clean surface to be contaminated with a concentration of 15.9 million asbestos structures per square centimeter (14.8 billion asbestos structures per square foot). I will testify that the results of these analysis shows that the fireproofing in the Embarcadero Center One building was the primary cause of the surface contamination, that the fireproofing is friable, and that the contaminated asbestos dust in this building can become reentrained from normal maintenance activity.

I will also discuss the amount of asbestos fibers that can become reentrained in the air given the percentage of asbestos in a gram of dust on a one square meter surface, using a reentrainment factor. I will testify that one gram of settled dust consisting of 0.1% asbestos collected from one square meter of surface in a room having an 8 foot ceiling generate fiber levels well in excess of the current OSHA action level or PEL.

6.0 Lung Tissue Analysis

I will discuss our analysis of lung tissue samples and will testify about the absence of asbestos fibers in some of the individuals lungs that we studied. Specifically, I have

analyzed eight lung tissue samples from humans ranging from 1 day old to eighty-seven years old. Asbestos fibers were found in only half of the individual lung samples, and no asbestos could be found in the subject who had lived the longest, an eighty-seven year old woman. Thus, it is my opinion that it is inaccurate to say that all individuals will have asbestos fibers in their lungs. I will also testify based on my experience, that asbestos is not found everywhere in the ambient air.

I will testify about our studies involving two individuals who died of mesothelioma from asbestos exposure in a building. I will testify that there can be as many as 24 quadrillion asbestos fibers in one (1) gram piece of W.R. Grace's Monokote-3 or U.S. Gypsum's Firecode fireproofing. Also, there can be as many as 72 quadrillion asbestos fibers in a one (1) gram piece of U.S. Gypsum's SprayDon and U.S. Mineral's Cafco Blaze Shield Standard. For a one (1) gram piece of U.S. Mineral's Cafco Blaze Shield Type D, there can be as many as 48 quadrillion asbestos fibers. Based on published data and my work, I will testify that there is an average of approximately 142 micrograms of asbestos in the lungs of mesothelioma victims. Based on these findings, I will make the following statements:

1) One gram of W.R. Grace's Monokote-3 equals the same amount of asbestos in 845 lungs of mesothelioma victims.

2) One gram of U.S. Gypsum's Firecode equals the same amount of asbestos in 845 lungs of mesothelioma victims.

3) One gram of U.S. Gypsum's SprayDon equals the same amount of asbestos in 2535 lungs of mesothelioma victims.

4) One gram of U.S. Mineral's Cafco Blaze Shield Standard equals the same amount of asbestos in 2535 lungs of mesothelioma victims.

5) One gram of U.S. Mineral's Cafco Blaze Shield Type D equals the same amount of asbestos in 1690 lungs of mesothelioma victims.

7.0 Defendants Testing and Experiments

I will testify that I have reviewed many of the documents regarding various testing procedures that were performed on asbestos containing fireproofing products discussed in this report. These tests were primarily done in the 1960's and early 1970's and relate to the following three general areas.

a. Physical Characteristics
b. Asbestos Fiber Release During Spray Application
c. In-Place Testing

7.1. Physical Characteristics

I will state that in the mid 1960's there was a GSA specification for the amount of dust that could be released from fireproofing (0.01 grams/sq.ft.) and still be acceptable to GSA. Outside testing laboratories such as Boyles Engineering, Kodaras Acoustical Laboratories and others provided this information using air erosion studies on fireproofing materials. The amount of "dusting" measured and reported by these testing companies was generally in a range that was acceptable to GSA at that time.

However, I will testify that the tests used by these groups were of a limited nature and were not designed to be able to determine if microscopic asbestos fibers were being released from the fireproofing during the erosion tests. Only large particulates could be seen. However, the Boyle, Kodaras and others test data does show some measurable dust release. Although the amount was below the GSA requirement from

that time period (the mid 1960's), the amount measured would equal billions of asbestos fibers being released in the dust.

7.2 Asbestos Fiber Released During Spray Applications

I will testify that on a number of occasions, air testing was done during the actual spray application of asbestos containing fireproofing in buildings for some of the products described in this report. I will further state that the levels measured in many of these tests were greater than today's current OSHA PEL standard of 0.1 fiber/cc, as well as in some instances, the current OSHA excursion limit of 1.0 fibers/cc. Additionally, I will state that some tests performed on behalf of the Sprayed Mineral Fibers Manufacturers Association exceeded the exposure standards of that time period.

7.3 In-Place Testing

I will testify that studies done in the late 1960's to early 1970's to measure release of asbestos fibers from in-place material were very limited in nature and not designed to determine if asbestos fibers were being released. I will base my testimony on my training, experience and, the various studies that I have reviewed including, but not limited to, the Tabershaw-Cooper tests, and the Valentine, Fisher & Tomlinson test. Additionally, I will state that none of these tests were done during a demolition, renovation or during normal maintenance activities that are routinely performed in a high rise building with fireproofing. In fact, these short comings in the tests were known to the W.R. Grace Research Group who made recommendations to test during these activities, but these recommendations were never implemented while they were manufacturing the product.

8.0 Alternative Materials

I will testify that the materials with which defendants eventually replaced the asbestos in their fireproofing products (cellulose, fiberglass and mineral wool) were

commercially available and used in other building products in the 1950s and 1960s. I will further testify that there was non-asbestos fireproofing products available in the 1950s and 1960s that had the same fireproofing properties and fire ratings as the asbestos containing counterparts. Additionally, I will testify that the asbestos in the defendants products did not provide any significant fire retardation to the product. That it was the non-asbestos ingredients in the products that provided all the fireproofing characteristics required by underwriters laboratories (UL) to become fire rated and certified.

Furthermore, I will state that non-asbestos Firecode was tested by U.S. Gypsum in 1962 and that this non-asbestos version had the same heat transfer characteristics as the asbestos containing Firecode. In my opinion, this demonstrates that U.S. Gypsum should have known that the addition of asbestos to their product did not enhance the fireproofing qualities of Firecode. I will further state that the Zonolite Company (predecessor to W.R. Grace) had a non-asbestos vermiculite gypsum fireproofing material that could be applied to both beams and decks by spray application and this material had the same fire rating as W.R. Grace's Monokote-3. I will give examples of buildings in this country where this non-asbestos fireproofing material was used. I will further testify that W.R. Grace's Monokote-4 was developed, tested and ready for the market while W.R. Grace was still selling asbestos containing Monokote-3. The testing of Monokote-4 showed that the non-asbestos fireproofing behaved as good as Monokote-3. I will further state that the use of this product demonstrates that a non-asbestos substitute for Monokote-3 could have been placed in the market many years earlier than it was. In fact, I will testify that both the technology and materials were available to produce a non-asbestos fireproofing product by the early 1960s.

I will testify that other asbestos containing products manufacturers, such as United

States Mineral Products Company, should have had knowledge that the asbestos content in their products were not a requirement to maintain the physical characteristics needed for fireproofing.

William E. Longo, Ph.D. 7/31/96 Date

VITAE

William Edward Longo
Materials Analytical Services, Inc.
3597 Parkway Lane, Suite 250
Norcross, GA 30092
Work Telephone: (770) 448-3200

Education

October 1980 to December 1983	Received Doctor of Philosophy in Materials Science and Engineering, University of Florida.
June 1979 to October 1980	Completed the requirements for a Master of Science in Materials Science and Engineering, University of Florida.
September 1973 to June 1977	Received Bachelor of Science degree; Major in Microbiology, Minor in Chemistry, University of Florida.

Professional Work History

September 1987 to present	President of Materials Analytical Services, Inc., Norcross, Georgia
August 1987 to February 1988	President and Founder of Longo Microanalytical Services, Inc., Gainesville, Florida.
October 1983 to August 1987	President and Founder of Micro Analytical Laboratories, Inc., Gainesville, Florida.
March 1985 to December 1987	Visiting Assistant Professor; University of Florida, Department of Materials Science and Engineering.
August 1983 to March 1985	Post Doctoral Associate; University of Florida, Department of Materials Science and Engineering.

Patents

U. S. Patent Serial No. 4,671,954 June 1987. Goldberg, E. P., Longo, W. E., and Iwata, H., "Microspheres for Incorporation of Therapeutic Substances and Methods of Preparation Thereof."

Patent Applications

U. S. Patent Application Serial No. 937,611 December 1986. Longo, W. E., McCluskey, R. A., and Goldberg, E. P., "Magnetically Responsive, Hydrophilic Microspheres for Incorporation of Therapeutic Substances and Methods of Preparation Thereof."

Publications and Presentations

Longo, W.E., and Rigler, M.W., "Rapid Identification of Inorganic and Organic Particulate for Routine IAQ Assessment" Indoor Environment meeting April 1996.

Longo, W.E., Rigler, M.W. and Slade, J., "Crocidolite Asbestos Fibers in Smoke from Original Kent Cigarettes" Cancer Research 55 11, 2232, 1995.

Longo, W.E., "Occupational Exposure From In-Place Asbestos Containing Fireproofing" Environmental Information Association, April 1995.

Keyes, D. L., Ewing, W. M., Hays, S. M., Longo, W. E. and Millette, J.R., "Baseline Studies of Asbestos Exposure During Operations and Maintenance Activities" Appl. Occup. Environ. Hyg. 9(11) Nov, 1994.

Goldberg, E.P., Quigg, J., Sitren, H., Hoffmann, E., Jayakrishnan, A., Longo, W. and Cantrell, J., "Microsphere Drug Carriers for Targeted Chemo Immunotherapy and for Intracellular Infections" 20th Annual Meeting of the Society for Biomaterials, 1994.

Millette, J.R., Longo, W.E. and Hubbard, J.L., "Demonstration of the Capability of Asbestos Analysis by Transmission Electron Microscopy in the 1960's" Microscope, 41 15, 1993.

Ewing, W. M., Chesson, J., Dawson, T. A., Ewing, E. M., Hatfield, R. L., Hays, S. M., Keyes, D. L., Longo, W. E., Millette, J. R., and Spain, W. H. "Asbestos Exposure During and Following Cable Installation in the Vicinity of Fireproofing" Environmental Choices Technical Supplement, Volume I, (2), 1993.

Longo, W. E., "Sampling and Analysis of Asbestos in Dust: An Update" Environmental Information Association, April, 1993. Nashville, Tennessee.

Keyes, D. L., Chessan, J., Hayes, S. M., Hatfield, R. L., Ewing, W. M., Longo, W. E. and Millette, J. R. "Re-Entrainment of Asbestos from Dust in a Building with Acoustical Plaster" Environmental Choice, Technical Support, Volume I, (6), 1992.

Longo, W. E. "A Standard Method for the Analysis of Asbestos in Settled Dust by TEM" Asbestos Measurement Risk Assessment and Laboratory Accreditation, ASTM Conference, July 1992. Johnson, Vermont.

Longo, W. E. and Roggli, V. L., "Mineral Fiber Content of Lung Tissue in Patients with Environmental Exposures: Household Contacts vs. Building Occupants" (B. Boland and J. Cullian EDS) in The Third Wave of Asbestos Exposure to Asbestos in Place. Annals of The New York Academy of Sciences, Volume 63, 1991.

Keyes, D. L., Chessan, J., Ewing, W. M., Faas, J. C., Hatfield, R. L., Hayes, S. M., Longo, W. E. and Millette, J. R. "Exposure to Airborne Asbestos Associated with Simulated Cable Installation Above and Suspended Ceiling" Am. Ind. Hyg. Assoc. J. (52) Nov. 1991

Longo, W. E. "Sampling and Analysis of Asbestos in Settled Dust" EPA/A&WMA Symposium on "Measurement of Toxic and Related Air Pollutants", May 1991. Durham, North Carolina.

Longo, W. E. "Asbestos Wipe Sampling" Industrial Hygiene Association, October 1990. West Palm Beach, Florida.

Longo, W. E. "Standard Test Method for Asbestos Concentrations in Dust Samples" American Society of Testing Materials Subcommittee D22.05.07, manuscript in progress.

Goldberg, E. P., Yalon, M., and Longo, W. E. "Low Voltage SEM for Unique Surface Analysis of Prosthetic Devices" Materials Research Society Symposium Proceedings 110, Biomedical Materials and Devices, 1989.

Longo, W. E. "Field Emission Scanning Electron Microscopy: An Alternative Technique for the Analysis of Asbestos Air Filter Samples" National Asbestos Council, September 1988. Boston, Massachusetts.

Goldberg, E. P., Yalon, M., and Longo, W. E. "Low Voltage Scanning Electron Microscopy for Improved Surface Characterization of Ocular Implants and Other Prosthetic Devices" American Chemical Society Symposium, September 1988. Los Angeles, California.

Longo, W. E. "Rinse Technique for Recovery of Air Samples for TEM Analysis" Asbestos Measurement Research and Laboratory Accreditation, ASTM Conference, July 1988. Johnson, Vermont.

Longo, W. E. "The Presence of Inorganic Fibers in Commercial Brands of Cigarettes" American Industrial Hygiene Conference, May 1988. San Francisco, California.

Longo, W. E. "Analysis of Asbestos by Transmission Electron Microscopy" Alabama Electron Microscopy Society 7th Annual Meeting, March 1988. Birmingham, Alabama

Longo, W. E. "Asbestos Fiber Loss from Air Sampling Cassettes: A Study by Transmission Electron Microscopy" EPA/APCA Symposium on Measurement of Toxic and Related Air Pollutants, May 1987. Research Triangle Park, North Carolina.

Longo, W. E. "Asbestos Air Sample Analysis by Transmission Electron Microscopy" American Industrial Hygiene Conference Professional Development Course, May 1987. Montreal, Canada.

Longo, W. E., Jenkins, E. J., Greene, R., and Baxter, D. "Water Refiltration: An Alternative Sample Preparation Method for the Analysis of Airborne Asbestos by TEM" National Asbestos Council, January 1987. Chicago, Illinois.

Longo, W. E., and Goldberg, E. P. in "Drug and Enzyme Targeting" (K. Widder and R. Green Eds) Methods of Enzymology, 112, 18, 1985.

Goldberg, E. P., Iwata, H., and Longo, W. E. "Hydrophilic Albumin and Dextran Ion-Exchange Microspheres for Localized Chemotherapy" (S. Davis, L. Illium, J. McVie, and E. Tomlinson Eds) in Microspheres and Drug Therapy. Pharmaceutical Immunological and Medical Aspects, 10, 309, 1984.

Hoffmann, E. M., Longo, W. E., and Goldberg, E. P. "Macrophage Uptake of Albumin Microsphere Drug Carriers" Proceedings of the 11th International Symposium on Controlled Release of Bioactive Materials, 11, 27, 1984.

Longo, W. E., and Goldberg, E. P. "Novel Albumin-Polypeptide-Drug Microspheres: Synthesis and Ion Exchange Drug Release Properties" Proceedings of the 10th International Symposium on Controlled Release of Bioactive Materials, 10, 245, 1983.

Longo, W. E., Iwata, H., Lindheimer, T., and Goldberg, E. P. "Preparation and Drug Release Properties of Albumin-Polyglutamic Acid-Adriamycin Microspheres" American Chemical Society, 24, 56, 1983.

Longo, W. E., Iwata, H., Lindheimer, T., and Goldberg, E. P. "Preparation of Hydrophilic Albumin Microspheres Using Polymeric Dispersing Agents" J. Pharm. Sci., 71, 1323, 1982.

Goldberg, E. P., Iwata, H., Terry, R. W., Longo, W. E., Levy, M., and Cantrell, J. L. in "Affinity Chromatography and Related Techniques" (Visser, Visser and Nivard Eds), Elsevier, Amsterdam, 375, 1982.

Longo, W. E., Iwata, H., and Goldberg, E. P. "Hydrophilic Albumin-Polyglutamic Acid-Adriamycin Microspheres for Localized Chemotherapy" 8th Annual Meeting of the Society of Biomaterials, 10, 60, 1982.

Activities and Organizations

* Member of Environmental Protection Agency Workshop on Sampling and Analysis of Asbestos in Settled Dusts, July 1989.

* Member of Environmental Protection Agency Peer Review Group for the Asbestos Engineering Program, 1987 to present.

* Vice-Chairman of the National Asbestos Council Analytical Subcommittee on Transmission Electron Microscopy 1987-1988.

* Chairman of National Asbestos Council Analytical Subcommittee on Transmission Electron Microscopy 1988-1989.

* Member of ASTM D-22-05 Subcommittee for Indoor Air Pollution.

Lectures and Courses Instructed

1) Longo, W. E. "Settled Dust: Asbestos and Other Particulates" Georgia Institute of Technology Seminar, August 1991.

2) Longo, W. E. "The Role of the Laboratory Manager, Quality Assurance Officer and the Analyst for NIST Accreditation" Georgia Institute of Technology, Transmission Electron Microscopy Asbestos Accreditation Seminar, August 1989.

3) Longo, W. E. 24th Annual Meeting of the Microbeam Analysis Society, "Asbestos Analysis Session" Ashville, North Carolina, July 1989 (Session Co-Chairman).

4) Longo, W. E. "Fundamentals of Asbestos Analysis by TEM" Institute in Materials Science State University of New York, New Paltz, New York, October 1988 (Course Director).

5) Longo, W. E. "TEM Imaging/Photography" Georgia Institute of Technology, Transmission Electron Microscopy Asbestos Analysis Course, June 1988.

6) Longo, W. E. "Laboratory Preparation of Polycarbonate Filters for TEM Analysis" Georgia Institute of Technology, Advanced Transmission Electron Microscopy Asbestos Analysis Course, February 1988.

7) Longo, W. E. "Transmission Electron Microscopy Laboratory Set-Up" Georgia Institute of Technology, Advanced Transmission Electron Microscopy Asbestos Analysis Course, February 1988.

8) Longo, W. E. "Laboratory Analysis of Asbestos" Hall-Kimbrell Seminar in Asbestos Abatement in the State of Florida, January 1988.

9) Longo, W. E. "Air Sample Preparation and Analysis by TEM" Georgia Institute of Technology, Clearance Testing for Asbestos: AHERA Regulations, October 1987.

10) Longo, W. E. "Asbestos Air Sample Analysis by Transmission Electron Microscopy" American Industrial Hygiene Conference Professional Development Course, Montreal, Canada, May 1987.

Professional Memberships

1)	American Industrial Hygiene Association	1985 to Present
2)	American Society for the Testing of Materials	1987 to Present
3)	National Asbestos Council	1984 to Present
4)	Environmental Information Association	1993 to Present
5)	Materials Research Society	1988 to Present
6)	Electron Microscopy Society Association	1988 to Present
7)	Microbeam Analysis Society	1988 to Present
8)	New York Academy of Science	1985 to 1987 1989 to Present
9)	Air Pollution Control Association	1985 to 1987
10)	National Institute of Building Sciences	1991 to Present

11)	The Society for Ultrastructural Pathology	1996
12)	American Society of Heating, Refrigerating and Air-Conditioning Engineers	1996

10.0 References and Reports

My opinions are based on my own background, training, experience, studies and research, and the writings and studies of other scientists and governmental bodies.

The following is a listing of principal materials and exhibits upon which I will base my opinions. I may rely in whole or in part on the following documents and items, as well as the opinions, data, and publications contained in other plaintiffs expert reports. I may also comment on the reports, data or testing done by defendants and defendant's experts.

Additionally, I may rely on my product identification reports which were the subject of my deposition of November 12 through 15, 1991.

1. Photomicrograph comparison of asbestos fibers by phase contrast microscopy and transmission electron microscopy

2. Slide Presentation regarding the Indirect Dust Analysis

3. Millette, J.R., W.M Ewing and R.S. Brown, "Stepping on Asbestos Debris." Microscope, vol. 38, 1990 pp 321-326.

4. Millette, J.R., W.M. Ewing and R.S. Brown, "A Close Examination of Asbestos-Containing Debris", NAC Journal Fall 1990, pp. 38-40.

5. Keyes, D.L., Ewing, W.M. et al., "Baseline Studies of Asbestos Exposure During Operations and Maintenance Activities" Appl. Occup. Environmental Hygiene, vol 9, No. 11 (1994)

6. Overlay demonstration of the indirect analysis

7. Keyes, D.L., Chesson, J., et al. "Reentrainment of Asbestos from Dust in Building with Acoustical Plaster" Environmental Choices Technical Supplement, vol. 1, No 1 (1992)

8. Ewing, W.M., Chesson, J., et al. "Asbestos Exposure During and Following Cable Installation in the Vicinity of Fireproofing" Environmental Choices Technical Supplement vol. 2, no 1 (1993).

9. Keyes, D.L., Chesson, J., et al. "Exposure to Airborne Asbestos Associated with Simulated Cable Installation Above a Suspended Ceiling" Am Ind. Hyg. Assoc J. 52, pp. 479-484 (1991).

10. ASTM Method D-5755 (1995)

11. GSA Asbestos Abatement Guide Specification 02085 (July 1993)

12. Asbestos Issues, October 1990, MAS Advertisement

13. W.R. Grace memo from J.C. Yang to R.J. Bettacchi (May 19, 1986)

14. Letter from Michael E. Beard to Vickie H. Ainslie (August 20, 1991)

15. MAS analysis on dust samples from 888 project (Sept. 8, 1992)

16. MAS analysis on dust samples from First Union Bank Building (October 14, 1992)

17. MAS analysis on dust samples from Multi-Foods, Town of City Center (July 13, 1992).

18. MAS analysis on dust samples from Galtier Plaza (April 6, 1992)

19. MAS analysis on dust samples from Clayton Executive Center II (Feb. 10, 1992)

20. MAS analysis on dust samples from 130 John Street, Project M1839

21. MAS analysis on dust samples from 130 John Street, Project M13586

22. MAS analysis for dust samples from Hunt Valley Marriott Hotel, project M2074

23. MAS analysis on dust samples from the Renaissance Tower, project M2246

24. MAS analysis on dust samples from the Prudential Plaza Newark building, project M1526

25. MAS analysis on dust samples from the Prudential Plaza Newark building, project M13584

26. MAS analysis on dust samples from the 5-Penn Center, project M1527

27. MAS analysis on dust samples from the 5-Penn Center, project M13585

28. MAS analysis on dust samples from the Embarcadero Center 1, project M1869

29. MAS analysis on dust samples from the Embarcadero Center 1, project M13471

30. MAS analysis on dust samples from the Embarcadero Center 2, project M1304

31. MAS analysis on dust samples from the Embarcadero Center 2 building, project M13250

32. MAS analysis on dust samples from the Embarcadero Center 2, project M13470

33. MAS analysis on dust samples from the Century Center buildings 2200 and 2600 project M2140

34. MAS analysis on dust samples from the First Florida Tower project M1811

35. MAS analysis on dust samples from the First Florida Tower project M13824

36. MAS analysis on dust samples from the 1100 Milam building, project M2252

37. MAS analysis on dust samples from Northland Towers project M1524

38. MAS analysis on dust samples from Northland Towers (West), project M15197

39. MAS analyses on dust samples from Northland Towers (East), project M15196

40. MAS analysis on dust samples from Northwest Financial Center, project M1892

41. MAS analysis on dust samples from the Southdale Office Complex, project M3038

42. MAS analysis on dust samples from the Twin Towers (Atlanta Gas Light) project M13887

43. MAS analysis on dust samples from the Prudential Plaza - Denver project M1161

44. MAS analysis or dust samples from Chatham Center, project M1303

45. MAS product identification analysis for bulk samples from Chatham Center (August 6, 1990)

46. MAS analysis on dust samples collected by Compass Environmental, project M13908

47. MAS analysis of dust samples from Prudential Plaza building, project M13678

48. MAS analysis of dust samples from 5-Penn Center, project M13677

49. MAS analysis of dust samples from Embarcadero Center 1 building, project M13748

50. Ewing, W.M., Dawson, T.A., et al. "Observations of Settled Asbestos Dust in Buildings", EIA Technical Journal, Summer 1996.

51. Letter to Mr. Henry J. Singer of the General Services Administration from Mr. William G. Rosenberg of the EPA dated December 29, 1992.

52. Millette, J.R. and Hayes, S.M, Settled Asbestos Dust: Sampling and Analysis, CRC Press Boca Raton, 1994.

53. Park, N.W., Walcott, R.J. and Brogan, P.A., "Worker Exposure to Asbestos During Removal of Sprayed Material and Renovation Activity in Buildings Containing Sprayed Material" American Industrial Hygiene Journal, vol. 44, No 6 (1983), pp 428-432.

54. Crankshaw, O.S., Perkins, R.L. & Beard, M.E., "An Evaluation of Sampling, Sample Preparation, and Analysis Techniques for Asbestos in Settled Dust in Commercial and Residential Environments" EIA Technical Journal, Winter 1995, pp 10-14

55. Wilmoth, R.C., Powers, J.T., and Millette, J.R., "Observations on Studies Useful to Asbestos O&M Activities" Microscope vol. 39, 1991 pps. 229-312

56. Crankshaw, Owen S., Research Triangle Institute "Quantitative Evaluation of the Relative Effectiveness of Various Methods for the Analysis of Asbestos in Settled Dust" (1995)

57. Report under EPA contract 68-03-4006 "Asbestos Fiber Reentrainment During Dry Vacuuming and Wet Cleaning of Asbestos-Contaminated Carpet."

58. Comparison of Airborne Asbestos Levels Determined by Transmission Electron Microscopy (TEM) Using Direct and Indirect Transfer Techniques EPA 560/5-89-004, March 1990

59. Letter from John J. Henningson to Dr. W.E. Longo (June 9, 1988) with MAS project M1322

60. RCA customer list for EMU-3C (1957)

61. W.R. Grace Laboratory Reports Index (04/06/61 - 07/23/64)

62. Markowitz, S.B., et al. "Asbestos Exposure and Fire Fignting" Annals New York Academy of Science, pp. 573-577

63. March 10, 1987, letter from William Cooley to Michael Tucker

64. June 15, 1983 memo from W.R. Wright to T.E. Winkel

65. November 6, 1986 memo from Julie C. Yang to D. Wightman

66. August 13, 1970 memo from R.E. Schneider to H.A. Brown

67. August 7, 1970 memo from H.L. Waxman to H.A. Brown

68. Cleveland Gypsum formula "Hushkote" (August 1962)

69. Formula and Mixing Instructions for Kilnoise Acoustical Plaster (June 18, 1959).

70. Formula for Red Top Acoustical Plaster (June 30, 1955)

71. Bennett, H., "Substitutes - A Handbook of Substitutes and Alternatives for Chemicals, Metals, Fibers and Other Commercial Products Including a Plan for Making a Proper Choice" Brooklyn, New York, Chemical Publishing Co., Inc. 1943.

72. MAS Report "Asbestos Structures in Lung Tissue - A Control Study" (Apr. 28, 1992)

73. MAS Report "Norma Sullivan" (July 16, 1990)

74. MAS Report "Donald R. Haasken" (Feb. 2, 1996)

75. Roggli, V.L., "Human Disease Consequences of Fiber Exposures" A Review of Human Lung Pathology and Fiber Burden Data" Environmental Health Perspectives vol. 88, pp. 295-303, 1990

76. Three Video Tapes of the Friability and Ceiling Tile Lifting Demonstration from the Prudential Plaza Newark, 5-Penn Center and Embarcadero Center One Building taken by Richard Hatfield

77. July 30, 1971 memo from R.C. Ericson to W.R. Rogers

78. November 2, 1971 memo from R.C. Ericson to W.R. Rogers

79. Tabershaw-Cooper Associates September 23, 1970 letter and report

80. April 16, 1962 United States Gypsum Company Research Center progress report summary

81. April 2, 1963, Department of Public Works City of San Francisco "Sprayed Applied Fireproofing Ease of Damageability Criteria and Test Program"

82. December 23, 1968, U.S. Mineral Products Company Research Report No. 351

83. Dust sample evaluation chart and attachments

84. January 4, 1971 memo from Spray Mineral Fiber, MFRS Assn. to Board of Directors

85. November 22, 1968 report from Dr. Hector Blejer of the Department of Public Health at the State of California to the California Zonolite Company

86. October 9, 1969 report from Peter Kostic to Mr. James Cintani

87. Tabershaw-Cooper Associates, July 13, 1970 report entitled, "Asbestos Fiber Concentrations in Air from Spray Fireproofing Operations Using Zonolite Products"

88. Werby Laboratories September 28, 1970 report

89. Froehling & Robertson September 1965 report entitled, "Test of Sprayed On Fire Protection Type MK for Resistance to Cracking, Flaking and Delamination Under 240 Foot Pound Impact"

90. Boyle Engineering Laboratories January 16th to 20th, 1967 report entitled, "Effect of High Velocity Air Upon the Surface of Mono-Kote Material Having a Dry Bulk Density of 16.85 ibs per cu. ft."

91. December 30, 1996 report from A.A. Sakhnovsey of the University of Miami to Eugene Perrine

92. Bowser-Morner Test Laboratories, October 6, 1970 report entitled, "Dusting Test Conducted on Zonolite Mono-Kote Fireproofing"

93. Werby Laboratories, July 16, 1970 report

94. Valentine, Fisher & Tomlinson September 3, 1970 report entitled, "Evaluation for Presence of Asbestos Particles in an Office Building Ventilation System"

95. Tabershaw-Cooper Associates, September 1, 1970 report entitled "Analysis of Air Samples Collected in the Bechtel Corporation Headquarters Building, San Francisco, CA"

96. Kodaras Acoustical Laboratory, April 11, 1968 report entitled, "Sprayed Mineral Fiber In Return Air Plenums"

97. December 18, 1967, United States Mineral Product Company letter to the National Gypsum Company enclosing the Air Erosion Test Method

98. Boyle Engineering Laboratory, June 28 to June 30, 1965 report entitled, "Air Velocity Surface Erosion Test on Firecode Plaster"

99. January 24, 1967 report from the Florida State Board of Health to Mr. Luis Benavides

100. International Testing Laboratories Inc., August 16, 1966 report entitled, "Dusting and Flaking Test at Cafco Blaze-Shield Type D Fiber"

101. September 30, 1965 memo from N. Buttino to F.M. Stumpf

102. December 16, 1966, United States Mineral Products Company letter from F. Stumpf to the Sprayed Mineral Fiber Manufacturers Association

103. January 23, 1967 letter from F. Stumpf to the Sprayed Mineral Fiber Manufacturers Association

104. June 16, 1967 and August 17, 1967 letters from William R. Bradley and Associated to the Sprayed Mineral Fiber Manufacturers Association

105. September 21, 1967 letter from William R. Bradley and Associates to Mr. H.L. Levine

106. Photomicrographs of a human hair fiber as compared to asbestos fibers

107. Photomicrographs of various asbestos/dust matrices from buildings discussed in Longo's Expert Prudential Report

108. Photomicrographs of constituents from bulk samples from buildings discussed in Longo's Expert Prudential Report.

109. Table Top Sonicator (can be inspected at MAS laboratory)

110. Yamate, G., et al. "Methodology for the Measurement of Airborne Asbestos by Electron Microscopy" EPA Contract No. 68-02-3266

111. Federal Register, Environmental Protection Agency, 40CFR 763, Asbestos Containing Materials in schools; final rule and notice, October 30, 1987. pp. 41829-41846

112. September 14, 1961 report United States Gypsum Company Research Center "Competitive Test, Monokote Fireproofing Plaster"

113. One Chase Manhattan Manufacturers, suppliers and vendors for new building project

114. Other reports and tests concerning asbestos containing fireproofing

115. August 23, 1984 memo from D.C. Wightman to T.E. Hamilton.

116. Photomicrographs of Ebola Virus

11.0 Depositions and Trial Testimony

To the best of my recollection and knowledge, I have given deposition testimony in the following cases within the last five years:

1. Montana-Dakota Utilities Co. v. W.R. Grace 1991
2. Clayton Center v. W.R. Grace 1991
3. Charleston County School Dist. V. U.S. Gypsum Co. 1991
4. State Farm Mutual Automobile Ins. Co. V. U.S. Mineral Products 1991
5. City of Wichita v. U.S. Gypsum 1991
6. Brevard County v. W.R. Grace 1991
7. Dayton Independent School District 1991
8. The Prudential Insurance Co. of America v. U.S. Gypsum et al. 1991
9. The Mayor and the City Council of Baltimore v. Keene Corp. et al. 1991
10. IBM v. USG 1992
11. Los Angeles United School Dist. v. Owens-Corning Fiberglas et al. 1992
12. Cullen Center Inc., Dresser-Cullen Venture & Dresser Industries, Inc. v. W.R. Grace et al. 1992
13. General Conference Corporation of Seventh-Day Adventists v. W.R. Grace 1992
14. John L. May, Archbishop of St. Louis v. AC&S Ins. 1992
15. Minnesota/California Partners v. Grace and Metropolitan Airport v. Grace 1992
16. Jackson Public School Dist. V. W.R. Grace 1992
17. Fargo Clinic v. USG 1992
18. State Farm v. W.R. Grace 1992
19. The First Savings Bank v. W.R. Grace 1992
20. Fargo Clinic v. W.R. Grace 1992
21. Commonwealth of Massachusetts v. USG 1993
22. RE Asbestos Schools Litigation v. U.S. Gypsum et al. 1993
23. County of San Diego v. W.R. Grace & Co. 1993
24. Commonwealth of Massachusetts v. Owens-Corning Fiberglas Corp. et al. 1993
25. Northern States Power v. USM 1993
26. Mid-Wilshire Associates Ltd. v. W.R. Grace & Co. 1994
27. Chase v. T&N 1994
28. Space Center v. W.R. Grace 1994
29. Commonwealth of Mass v. Owens-Corning Fiberglas 1994
30. Sunset Vine Towers v. Carey Canada 1994
31. Eden Park v. W.R. Grace 1994
32. Mt. Lebanon v. W.R. Grace 1994
33. Bell South v. W.R. Grace 1994
21. Piedmont Center v. W.R. Grace 1995
22. Board of Education of the City of Chicago v. A,C and S et al. 1995
23. Banc One Building Management v. W.R. Grace 1995

24. California Sansome Co. v. U.S. Gypsum et al 1995
25 Mr. John Roth v. Owens Corning Fiberglas Corporation et al. 1995
26. Cartwright Group 22 and Cartwright Group 24 v. Raybestos-Manhattan et al. 995
27. USDC/Burleigh/North Dakota v. W.R. Grace 1995 & 1996
28. Commonwealth of Kentucky v. U.S. Gypsum et al.
29. Transamerica Insurance Corporation of California v. W.R. Grace 1995
30. State of Hawaii v. W.R. Grace et al. 1996

To the best of my recollection and knowledge I have given sworn testimony in the following trials within the last five years.

1. Blue Cross and Blue Shield of South Carolina v. W.R. Grace Conn. 1991
2. Kansas City v W.R. Grace 1991
3. Brevard County v. W.R. Grace 1992
4. The Mayor and the City of Baltimore v. Keene Corporation et al. 1992
5. Bunker Hill Towers Condominium Assos. v. The Prudential Insurance Co. of America et al. 1992
6. Clayton Center v. Grace 1992 Bunker Hill 1992
7. MDU Resources Group v. W.R. Grace 1992
8. H&H Cerritos v. USM 1992
9. Seventh-Day Adventists v. W.R. Grace 1993
10. Trizec Properties v. U.S. Gypsum 1993
11. The Mayor and City Council of Baltimore v. Keene Corp. et al. 1993
12. State Farm v. Grace 1993
13. T.H.S. Northstar Assoc. v. W.R. Grace 1993
14. Northridge Co. v. W.R. Grace 1994
15. Commonwealth of Massachusetts v. Owens-Corning Fiberglas et al. 1994
16. John Corbally v. W.R. Grace & Co. 1994
17. Chase v. T&N 1995
18. John Roth v. Owens Corning Fiberglas Corporation et al. 1996
19. Jevene Newman v. Abex Corporation et al. 1996

12.0 Compensation

Materials Analytical Services, Inc. (MAS), will be compensated for my time that is spent working on this project. The rates that MAS will bill for my time is as follows:

1)	Consulting	$150.00 per hour
2)	Deposition	$225.00 per hour
3)	Trial Testimony.....	$225.00 per hour

For trial and deposition testimony, there is a half day minimum charge for my time. Additionally, reasonable expenses that are incurred are reimbursed back to MAS.